

**Kern River Watershed Coalition Authority**

# **Groundwater Trend Monitoring Work Plan: Phase II Monitoring Network Addendum**

Kern County, California  
July 31, 2018

Prepared for:



**Kern River  
Watershed**  
Coalition Authority

Prepared by:



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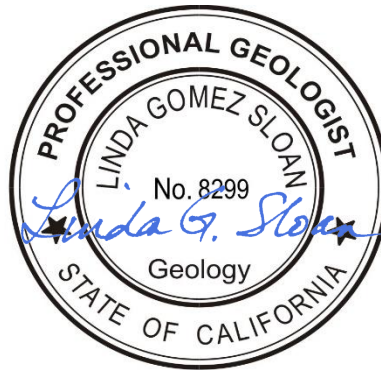
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## **Certifications**

This Groundwater Trend Monitoring Work Plan is signed by the following certified professionals:

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### 1 Introduction

This Groundwater Trend Monitoring Work Plan-Phase II Addendum (**GTMW-II Addendum**) has been prepared on behalf of the Kern River Watershed Coalition Authority (**KRWCA** or **Coalition**), in response to the Waste Discharge Requirements (**WDR**) General Order R5-2013-0120 for Growers within the Tulare Lake Basin Area that are Members of a Third-Party Group (**General Order**), adopted by the Central Valley Regional Water Quality Control Board (**RWQCB** or **Regional Board**) on September 19, 2013. This Addendum is prepared in response to comments received in a letter dated June 29, 2018, of Regional Board staff's review of KRWCA's Groundwater Trend Monitoring Work Plan-Phase II (**GTMW-II**), submitted on May 16, 2018.

The RWQCB staff requested additional information to supplement KRWCA's GTMW-II submittal to fulfill the requirements of the General Order. This Addendum fulfills the requirements of Attachment B MRP Section IV.E of the General Order and addresses staff's comments by providing:

- KRWCA's GTMW-II approach and rationale regarding selected monitoring wells and their locations;
- Location and construction details for wells composing the trend monitoring network;
- Proposed sampling schedule; and
- Proposed groundwater monitoring result submission process.

This Addendum clarifies the application of the KRWCA's GTMW-II approach in well selection and provides relevant well details for all wells the KRWCA has received permission to sample as part of the groundwater quality trend monitoring network for Fall 2018.

#### 1.1 Groundwater Quality Trend Monitoring Implementation and Work Plan Approach

##### 1.1.1 Groundwater Quality Trend Monitoring Implementation

Attachment B, Section IV.C.2 of the General Order requires the Trend Monitoring Work Plan to implement a groundwater monitoring network that represents both high and low vulnerability areas and employs relatively shallow wells or existing monitoring well networks. The network must consist of a sufficient number of wells to provide adequate coverage in the KRWCA to assess water quality conditions of groundwater and regional effects of irrigated agriculture.

###### 1.1.1.1 Well Depth Relative to Groundwater

Candidate wells in the KRWCA groundwater trend monitoring network was evaluated depending on local depth to groundwater. Well depth relative to groundwater depth information is provided in with available well construction details. Total completed depth of well, perforated interval, static water level, and Department of Water Resources (DWR) well completion reports (well log) are provided for all identified wells in the KRWCA monitoring well network (**Table 1**).

Where available, selected wells draw water from the upper zone, as defined in Section 3.3 of the CVGMC Workplan. The upper zone includes the area from the bottom of the vadose zone to any confining units (specifically the Corcoran Clay, if present). Although the Corcoran clay is often defined



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by the Central Valley Hydrologic Model (**CVHM**) mapping, the clay layer is not considered continuous or confining in many portions of the KRWCA. Due to this, each well log was reviewed to determine if any significant confining layers, specifically the Corcoran clay, were present. Wells identified as confined by the log were not included as candidate wells.

As directed by the Regional Board in the January 25, 2018, RWQCB staff's review of the KRWCA GTMW, areas where depth to groundwater exceeds several hundred feet must also be included in the trend monitoring network. Wells in these areas are often not completed in the uppermost zone of first encountered groundwater. In these areas, if no wells had a shallow completed depth compared to average groundwater level, wells with unconfined or composite perforated intervals were evaluated.

### *1.1.1.2 High and Low Vulnerability Area Coverage*

The KRWCA monitoring network described in this GTMW II - Addendum represents both high and low vulnerability areas. Candidate wells were evaluated in areas of varying groundwater quality and hydrogeologic conditions. **Figure 1** provides a map of the KRWCA's high and low vulnerability areas. Monitoring well location relative to vulnerability area and prioritization tier is provided in **Table 2**.

### *1.1.1.3 Irrigated Agriculture Coverage*

The KRWCA Fall 2018 monitoring network includes wells in areas predominately used for irrigated agriculture. Townships where less than 20% of the township is used for irrigated agriculture are intended to be represented by wells with similar commodity types, soils, and/or hydrogeologic characteristics. As directed by the January 25, 2018 RWQCB staff's review of the KRWCA GTMW predominate crops, such as almonds and grapes, will be addressed regionally, requiring fewer or a different distribution of wells in each coalition. **Figure 2** provides a map of KRWCA's 2018 monitoring network relative to major commodities. **Table 2** provides a list of the commodities grown in proximity to identified wells.

## **1.1.2 Ground Water Quality Trend Monitoring Work Plan Approach**

Attachment B, Section IV.E.1 of the General Order requires that the Trend Monitoring Work Plan provide details regarding the rationale for the number of proposed wells to be monitored and their locations. The rationale must consider:

- Variety of agricultural commodities produced within the third party's boundaries;
- Conditions identified in the Groundwater Quality Assessment Report (**GAR**) related to the vulnerability prioritization within the coalition area; and
- Areas identified in the GAR that contribute significant recharge to urban and rural communities where groundwater serves as a significant source of supply.

In the KRWCA GTMW-II, Section 4.2.2, these considerations were assigned a range of scores and relative scale. As required in the General Order, areas upgradient of communities reliant on groundwater were prioritized and weighted with respect to this classification. The resulting scale defaulted all irrigated acreage upgradient of a disadvantaged community (**DAC**) to the highest HVA prioritization, Tier I, for selection. This prioritization was applied to all identified HVA's. **Figure 1** provides a map of the KRWCA's prioritization of identified HVA's. Each township was assessed for the considerations and scored according to the given scale. A sum of the weighted scores yielded the



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maximum number of wells to be selected for monitoring in a township. One to three wells per township were selected as a maximum monitoring density based upon the assessed monitoring priority ranking.

### **1.1.3 Proposed Work Plan Implementation and Analysis**

The KWRCA supports the concept presented in Section 3.6, “Dynamic Network: Adaptive Design and Refinement,” of the CVGMC Technical Workplan. The initial well network design will require ongoing evaluation of the spatial representation and sufficiency to fulfill the objectives of the General Order. The KWRCA will evaluate the adequacy of the GTMW II – Addendum monitoring network over time with respect to changes in the distribution of irrigated agriculture and groundwater quality monitoring results. Spatial coverage of the monitoring well network will be adaptive and necessary changes will be made to maintain a regional representation of groundwater quality. Changes to the trend monitoring network will be discussed with Regional Board staff at least 60 days before trend monitoring begins for the next water year (October 1 – September 30).

### **1.1.4 Candidate Well Identification**

Well records were collected from Department of Water Resources (DWR), Kern County Public Health (KCPH), KRWCA associated Water Districts, and directly volunteered from KRWCA Members.

The DWR Online System for Well Completion Reports (OSWCR) was used to download datasets and files of all Well Completion Reports available for Kern County. Information requests were made to KCPH for data sets of all completed Well Permits and available Well Permit files were downloaded for review. Well completion datasets were queried for the KRWCA monitoring area, date of completion, and depth of well.

Records from the DWR and KCPH were limited in quality or unavailable for most wells completed prior to 1989 as many Kern County records were destroyed in a flood/fire in that year.

Existing wells were identified from the available records as a candidate based on the following criteria:

- Well located within a proposed monitoring area as defined by Township/Range;
- Well use other than point source monitoring;
- Well seal present to a minimum depth of 20 feet made of cement or bentonite; and,
- Well depth relative to local groundwater depth:
  - Perforated interval within 50-150 feet below average groundwater level, where available, or,
  - Perforated interval begins above significant confining subsurface material.

Wells found within each township were evaluated relative to minimum and maximum depth to groundwater for 2011-2017 obtained from DWR. Township and Ranges where an insufficient number of wells were identified as shallow relative to groundwater were re-evaluated. The secondary evaluation included wells that are still considered unconfined or composite.



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There were 290 candidate wells identified as meeting the above criteria from querying DWR and KCPH records. These candidate wells were researched to determine precise well location and well ownership to request access to complete site assessments and conduct monitoring annually. If a Well Completion Report did not provide enough usable location information, it was cross referenced with a KCPH well permit where possible. Of the identified candidate wells, 97 (33%), could not be located or associated with ownership due to insufficient or inaccurate information. Of located candidate wells, 45 (23%), were found to be less than ½ mile from significant point source dischargers including wastewater treatment facilities, confined animal facilities, and large industrial complexes.

Well owners of the located candidate wells not in proximity to dischargers, 147 wells, were mailed a request to access the well and conduct assessment and annual monitoring. This included 41 wells on enrolled member parcels and 106 wells on non-member parcels. Access to conduct assessment and annual monitoring was only permitted for 34 (23%) of the requested wells. Members who did not permit access indicated that there was no well on the location referenced, the well was dry, or there was a significant issue with proximity to dischargers which had not been identified by proximity analysis.

Well information was also directly volunteered by Water Districts, KRWCA Members, and landowners in the KRWCA boundary. Well information provided by Water Districts and volunteers frequently did not include construction information and associated Well Completion Reports. A volunteered well was disqualified as a candidate if construction information could not be found to confirm a sanitary seal, perforated interval, and well depth. If construction information was available, the volunteered well was also reviewed against the criteria for location, use, and relative depth to groundwater.

Site assessments were authorized and completed at 46 well sites, as described in the following section.

### 1.2 Well Construction Details, Site Assessments and Selection Criteria

Attachment B, Section IV.E.2 requires details for wells proposed for trend monitoring, including:

- Global Positioning System (GPS) coordinates;
- California State Well Number (if known);
- DWR Well Completion Report/Driller's Log Number;
- Well depth;
- Top and bottom perforation depths;
- A copy of the well driller's log (if available);
- Depth of standing water (static water level), if available; and
- Well seal information (type of material and length of seal).

Required well construction details were collected for the GTMW II – Addendum trend monitoring wells during the candidate identification process. After permission to access a candidate well was



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obtained, wellhead surveys and assessments were completed prior to July 31, 2018. Wellhead surveys provided:

- Well location information (latitude, longitude);
- Well site proximity assessment; and
- Well head assessment.

Well site proximity assessments evaluated the presence of irrigated agriculture, nearby influences or point source dischargers, and communities reliant on groundwater in proximity to respective wells. Well head assessments determined the well accessibility, maintenance condition, and ability to sample respective wells. The assessed candidate wells which met wellhead and site proximity criteria are the final well selections for monitoring. The dataset of well details, including construction and location information for the trend monitoring well network is provided in [Table 1](#). The proximity evaluations and HVA identification of wells composing the KRWCA trend monitoring well network is provided in [Table 2](#).

Supplemental groundwater quality data from public supply wells constructed in the upper zone and adjacent Coalition monitoring well networks may be used in areas which permission to conduct groundwater quality sampling could not be obtained.

### 1.3 Proposed Sampling Schedule

As specified in Attachment B, MRP Section IV.E.3 of the General Order, trend monitoring wells must be sampled, at a minimum, annually at the same time of year. Sampling is proposed to begin in accordance with the CVGMC Technical Workplan, which specifies sampling in Fall 2018 pending workplan approval. The KRWCA will sample annually in accordance with CVGMC coordination. Sampling will include all the constituents listed in [Table 3](#) (originally Table 5-1 in KRWCA's GTMW Phase II) as required in Attachment B, MRP Section IV.E of the General Order.

If data from existing monitoring networks or public supply wells are used, analyses will include all applicable constituents and parameters listed as required in Attachment B, MRP Section IV.E.

### 1.4 Annual Groundwater Monitoring Reporting

As required in Attachment B, MRP Section IV.E.3 and MRP Section V.B, the KRWCA will submit required groundwater monitoring results as an Excel workbook containing an export of all data records uploaded to the State Water Resources Control Board's GeoTracker database. Shapefiles for needed key figures/maps will be submitted in a readable format and media type with the report submittals. In the case that any data are missing from the report, a submittal will be included with a description of what data are missing and when they will be submitted to the Regional Board. Samples collected during the early part of the 2018-2019 water year (after 1 October 2018) will be reported and evaluated in coordination with the CVGMC specified timelines.



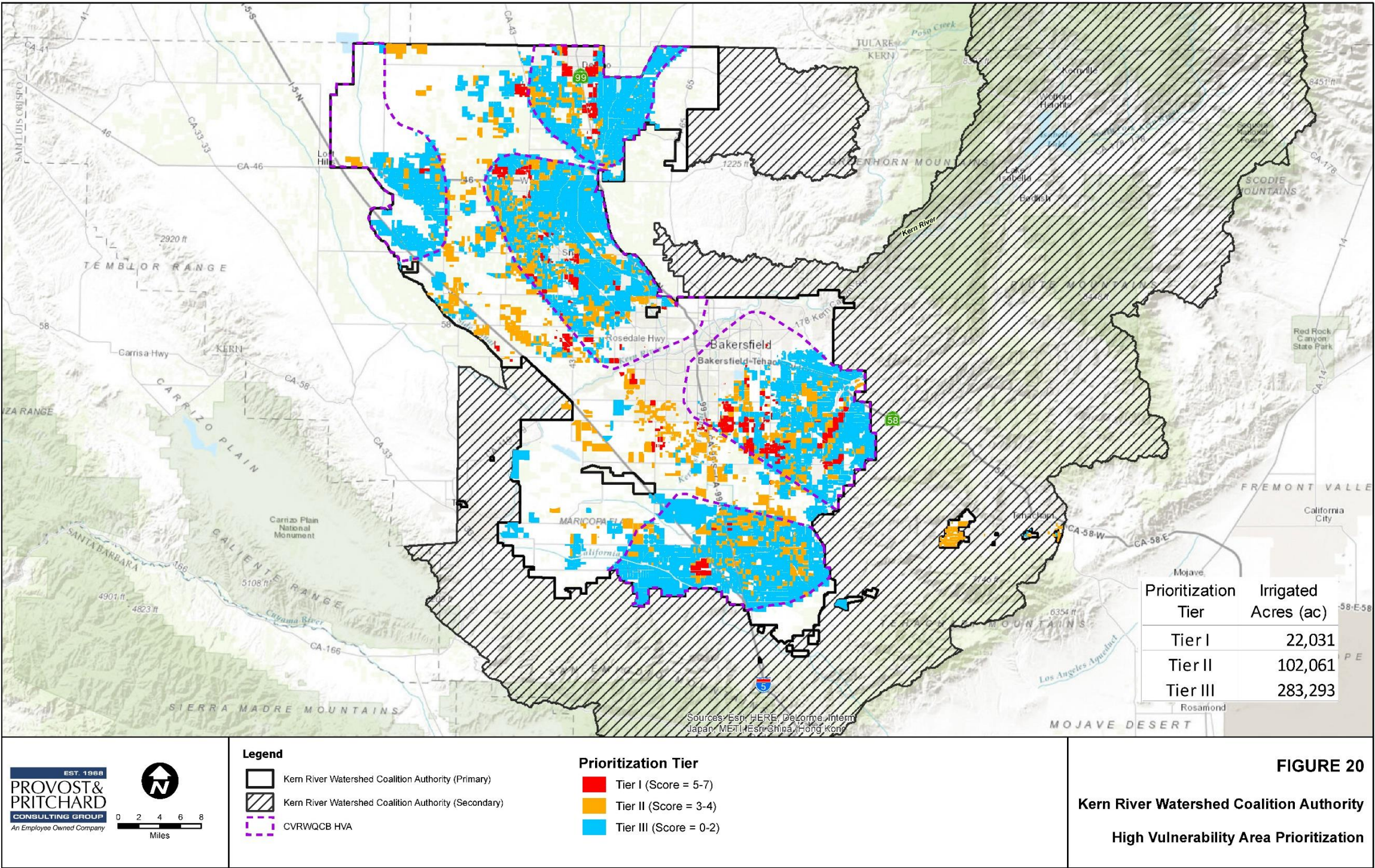


Figure 1. KRWCA High Vulnerability Areas & Prioritization



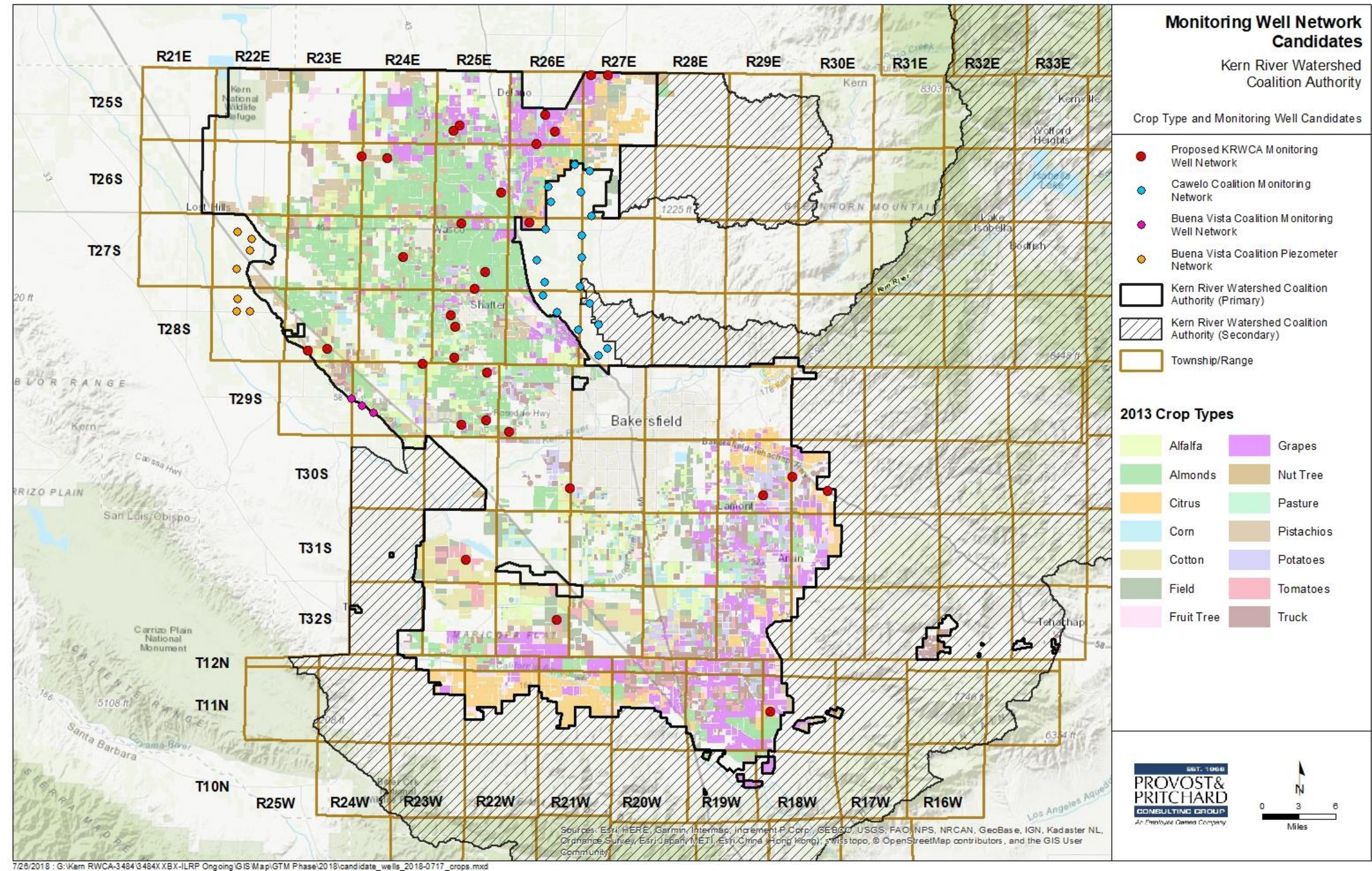


Figure 2. KRWCA's Well Monitoring Network Proximity to Commodities





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Table 1. KRWCA’s Well Location and Construction Details

Latitude	Longitude	Well Depth (feet)	Top Perforation Depth (feet)	Bottom Perforation Depth (feet)	Well Drillers Log Number (if available)	Depth to Standing Water (feet) (if available)	Sanitary Seal Depth (feet)
35.739217	-119.169750	500	320	500	396887	303.4	310
35.719301	-119.156223	600	400	600	508093	170.15	50
35.704598	-119.182706	440	340	440	508094	314.26	50
35.787290	-119.080091	800	400	600	E0068721	399.95	50
35.787245	-119.103593	405	185	405	E0012452	340.45	50
35.686530	-119.437574	400	200	400	E0023106		50
35.685642	-119.400603	400	320	400	724867	450+	100
35.646523	-119.233053	920	-	-	-	54.22	330
35.567805	-119.375485	400	320	400	569623	309.75	287
35.609113	-119.290392	600	340	600	E034337	62.42	320
35.551160	-119.255341	838	360	800	1091572	-	50
35.530893	-119.269796	810	380	810	e0239535	368	350
35.610693	-119.191118	800	400	800	E0068435	433.95	30
35.457227	-119.483826	440	120	440	E0074073	68.95	100
35.455102	-119.512414	380	160	380	780438	-	150
35.485639	-119.298258	850	300	827	E0163192	334.25	240
35.499164	-119.304602	400	320	400	373298		50
35.448944	-119.298054	870	345	870	E0219847	-	330
35.441187	-119.344969	602	221	361	e0146271	-	140
35.431794	-119.251364	620	279	620	e0194674	297.09	240
35.374429	-119.251713	350	260	350	-	173.3	-
35.369321	-119.286967	310	210	310	-	202.25	-
35.288945	-118.846977	910	390	910	e0360864	-	50
35.310660	-118.805446	1220	560	1220	e0261310	-	50
35.294204	-118.753347	500	400	500	e0141238	-	350
35.208606	-119.278288	960	280	960	E0070644	178.65	190
35.031128	-118.834572	720	540	700	E0069441	-	50
35.137737	-119.145302	1020	540	1020	542931	402	50
35.361708	-119.217059	430	360	430	-	196.95	-
35.718450	-119.304233	340	200	340	900615	69.42	100
35.725116	-119.294831	300	158	298	E0073851	122.03	100
35.294764	-119.128454	410	290	390	-	206.72	-



Table 2. Well Proximity Analysis

Latitude	Longitude	Proximity to Irrigated Agriculture (0.25 mile radius)	Crops Grown Nearby (Top 2-3 within 0.25 mile radius)	Proximity to Communities Reliant on Groundwater (2 mile radius)	Located in High Vulnerability Areas? (0.25 mile radius)	If yes to HVA, Tier?
35.739217	-119.169750	Yes	Grapes	No	Yes	Tier II
35.719301	-119.156223	Yes	Grapes, Citrus, Almonds	No	Yes	Tier III
35.704598	-119.182706	Yes	Grapes	Yes	Yes	Tier III
35.787290	-119.080091	Yes	Grapes, Pistachios	No	Yes	Tier III
35.787245	-119.103593	Yes	Pistachios, Almonds	No	Yes	Tier III
35.686530	-119.437574	Yes	Pistachios, Alfalfa	No	Yes	Tier II
35.685642	-119.400603	Yes	Almonds, Pistachios, Field Crops	No	Yes	Tier I
35.646523	-119.233053	Yes	Almonds	Yes	Yes	Tier II
35.567805	-119.375485	Yes	Fruit tree, Almonds, Alfalfa	Yes	Yes	Tier II
35.609113	-119.290392	Yes	Almonds, Truck	No	Yes	Tier III
35.551160	-119.255341	Yes	Almonds	No	Yes	Tier II
35.530893	-119.269796	Yes	Grapes, Field, Cotton	No	Yes	Tier III
35.610693	-119.191118	Yes	Grapes, Citrus, Fruit Tree	No	Yes	Tier II
35.457227	-119.483826	Yes	Almonds, Alfalfa	No	Yes	Tier III
35.455102	-119.512414	Yes	Pistachios, Cotton	No	Yes	Tier II
35.485639	-119.298258	Yes	Almonds, Pasture, Grapes	Yes	Yes	Tier I
35.499164	-119.304602	Yes	Almonds, Pistachios	No	Yes	Tier I
35.448944	-119.298054	Yes	Almonds, Pistachios	No	Yes	Tier I
35.441187	-119.344969	Yes	Almonds, Corn, Field	No	No	
35.431794	-119.251364	Yes	Grapes, Truck, Almonds	Yes	Yes	Tier I
35.374429	-119.251713	Yes	Truck	Yes	Yes	Tier I
35.369321	-119.286967	Yes	Almonds, Truck, Grapes	Yes	Yes	Tier II
35.288945	-118.846977	Yes	Truck, Field, Potatoes	No	Yes	Tier II
35.310660	-118.805446	Yes	Citrus, Potatoes, Truck	Yes	Yes	Tier III
35.294204	-118.753347	Yes	Citrus, Fruit Tree	Yes	Yes	Tier III
35.208606	-119.278288	Yes	Cotton, Tomatoes	No	Yes	Tier II
35.031128	-118.834572	Yes	Citrus, Grapes	No	Yes	Tier III
35.137737	-119.145302	Yes	Field, Tomatoes	Yes	Yes	Tier II
35.361708	-119.217059	Yes	Almonds, Alfalfa, Truck	No	Yes	Tier III
35.718450	-119.304233	Yes	Almonds, Alfalfa, Truck	Yes	Yes	Tier III
35.725116	-119.294831	Yes	Grapes	No	Yes	Tier II
35.294764	-119.128454	Yes	Cotton	No	No	





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**Table 3. Groundwater Sampling Analyses and Schedule**

Frequency			Indicator Parameter	Reporting Units	Field Measurement	Laboratory Analysis	Analysis Method
Initial Sample	5-Year	Annual	Electrical Conductivity (EC)	µmhos/cm	•		Field Instrument
			pH	pH units	•		Field Instrument
			Dissolved Oxygen (DO)	mg/L	•		Field Instrument
			Temperature	oC	•		Field Instrument
			Nitrate as Nitrogen	mg/L		•	Method 300.0
			Total Dissolved Solids (TDS)	mg/L		•	Method 2540C
			General Minerals - Anions (carbonate, bicarbonate, chloride, sulfate)	mg/L		•	Method 2320B
			General Minerals - Cations (boron, calcium, sodium, magnesium, potassium)	mg/L		•	Method 200.7